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HAWAIIAN MONK SEAL ASSOCIATION PATTERNS ON LISIANSKI ISLAND: 1982 PILOT STUDY RESULTS

THEA C. JOHANOS
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA
Honolulu, Hawaii 96812

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INTRODUCTION

This report describes findings of a pilot study on the intraspecific association patterns of the endangered Hawaiian monk seal, Monachus schauinslandi, conducted on Lisianski Island, Northwestern Hawaiian Islands (NWHI) in 1982 by the Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, NOAA. An understanding of the monk seal's association patterns is important because adult males outnumber adult females on some islands in the NWHI, and adult males have been observed to harass, injure, and kill adult females and immature seals of both sexes. This adult male behavior may significantly affect survival of females and thus further increase the imbalance between the sexes.

METHODS

Study Area

Lisianski Island (lat. 26°02'N, long. 174°00'W) is located in the NWHI approximately 905 nmi from Oahu. Its nearest neighbors are Laysan Island, 116 nmi to the southeast, and Pearl and Hermes Reef, 130 nmi to the northwest.

Lisianski Island is a coral-sand island of approximately 450 acres. The interior is covered with low vegetation and a narrow beach extends almost entirely around the 3.2-mile shoreline which is broken by coral ledges along the southeastern side and a broader expanse of beach on the southern tip of the island. Clapp and Wirtz (1975) give information on the natural history of Lisianski Island.

Subjects

Lisianski Island has a discrete, almost closed resident monk seal population (Stone 1984). In 1982 each individual in the entire population was identified by natural markings and scar patterns and by artificial bleach marks on the pelage. The population totaled 242 individuals: 27 pups of the year and 215 older monk seals. Adult males outnumbered adult females by a ratio of 2.5:1. The sex ratio was less skewed in the immature age classes but males outnumbered females in all age classes.

Data Recording

Field data were collected from 21 April to 12 September 1982 during censuses and patrols. Data were collected concurrently with other monk seal studies being conducted by a two to six person Honolulu Laboratory field camp. Censuses were conducted every 2 days by two to three observers. Censuses began at 1300 Hawaii standard time and lasted approximately 2 h each. Census procedure is described in detail by Stone (1984). Starting 11 July, patrols were conducted in addition to censuses. On census days an evening patrol was conducted and on noncensus days

morning and evening patrols were conducted. Morning and evening patrols began at 0900 and 1600, respectively. Patrols were conducted by two observers and also lasted approximately 2 h each. Patrols followed census procedure, except that only adult male seals and their "associated" animals were recorded. Census and patrol routes were rotated among observers to reduce observer bias.

In addition to data collected during censuses and patrols, incidental association data were collected when one or more of the "associated" animals could be positively identified. Association data collection was optional and collection effort varied among observers.

Two major types of association data were obtained:

1. Data on haul-out distances between individuals were recorded as the observer came abreast of the subjects. The age, sex, and identity of the individuals were recorded and distance between seals was scored into one of three categories: a) $\leq$1 m, b) >1 m and $\leq$5 m, or c) >5 m.

2. Data on behavioral interactions between individuals were obtained by focal animal and focal group observations (Altman 1973). Interactions that occurred within 30 m of the observer were recorded as bouts (sequences of interactions between individuals). The age, sex, and identity of the participants as well as the nature of the behavior exhibited were recorded.

RESULTS

Haul-Out Distances

Association incidents in which the seals were hauled out $\leq$5 m from each other totaled 1,142 and 144 behavioral bouts were recorded. Adult females spent more of their time ashore accompanied by adult males than did any other age or sex group ($P<0.05$). Adult females were observed within 1 m of an adult male on an average of 31.8% of their census sightings. The average proportion of census sightings in which other age and sex classes were within 1 m of an adult male was 7.4% for immature females, 3.8% for immature males, 0.5% for female weaned pups, and 0.9% for male weaned pups (Fig. 1).

Individual males differed in their spatial association patterns. More males were observed to associate with adult females than were observed to associate with immature seals (Fig. 2). Forty-two of the 101 adult males in the Lisianski population were seen within 1 m of an adult female on >10% of their census sightings, whereas only 6 were observed within 1 m of an immature seal on >10% of their census sightings. Thirty-one of the adult males were never seen within 1 m of an adult female on census, in contrast to 60 which were never seen within 1 m of an immature seal.

Behavioral Interactions

Nearly all agonistic interactions involved two adult male contestants ($P<0.05$), and 97% of all bouts involved two adult males, whereas agonistic interactions between adult females were not observed. The overall rate of adult male-male interactions decreased from 3.4 bouts/census in April to zero in September (Fig. 3).

A higher proportion of adult male-male agonistic bouts occurred when adult males were within 5 m of an adult female than when adult males were within 5 m of an immature seal ($P<0.05$) or when adult males were farther than 5 m from an adult female or immature seal ($P<0.05$). There was no difference in the proportion of bouts that occurred between adult males when they were within 5 m of subadult males, subadult females, juvenile males or juvenile females ($P>0.05$) (Fig. 4). The agonistic pattern changed seasonally. In April there was no difference ($P>0.05$) between the proportion of bouts that occurred when adult males were within 5 m of an adult female, an immature seal, or neither. However, from May through August, the proportion of adult male-male bouts which occurred when an adult female was within 5 m of the contestants was higher ($P<0.05$) (Fig. 5).

The average number of bouts observed per individual was lowest for those males that were never observed within 1 m of an adult female on census. The average number of bouts per individual increased with increased percent of census sightings observed with adult females, until it was highest for those males that were observed within 1 m of an adult female on 25-30% of their census sightings. However, as percent of census sightings observed with adult females increased above 30%, bouts decreased; males with the highest percent of census sightings within 1 m of an adult female (45-50%) had a lower average number of bouts than all other groups except males that were never observed within 1 m of an adult female (Fig. 6).

DISCUSSION

Adult males preferentially haul out next to and compete over adult females, and the rate of aggressive interaction is highest in the spring and early summer when the majority of adult females come into estrus.

Individual adult males differ in their spatial association patterns with adult females and immature seals, and also differ in their number of male-male bouts. The relationship between individual adult male spatial association patterns with adult females and the number of male-male aggressive interactions observed per individual indicates a possible dominance hierarchy among the adult male monk seals. No advantage is gained by challenging a contestant unless there is a good chance of victory (Maynard-Smith and Price 1973). Therefore, given a dominance heirarchy, highly dominant adult males will not be challenged in their access to adult females whereas less dominant individuals will experience a high number of challenges while in the immediate vicinity of an adult female.

An understanding of the adult male monk seal intraspecific association pattern is important because adult males have been observed to harass, injure, and kill adult female and immature seals, both acting alone or in groups during mass mobbings (instances when adult males collectively act aggressively towards other seals) (Johnson and Johnson 1981; Alcorn and Buelna[1]; Delong et al.[2]; Johanos and Kam[3]). Mobbings have immediately preceded the death or disappearance of several adult and subadult females, and may well increase the imbalance between the sexes seen at some islands in the NWHI.

Further study is needed to determine:

1. Whether there is a relationship between the occurrence of mobbing behavior and observed differences in association patterns between individuals.

2. Whether the behavior of harassing and mobbing adult females or immature seals is general or confined to a small number of rogue individuals in the adult male population.

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LIST OF FIGURES

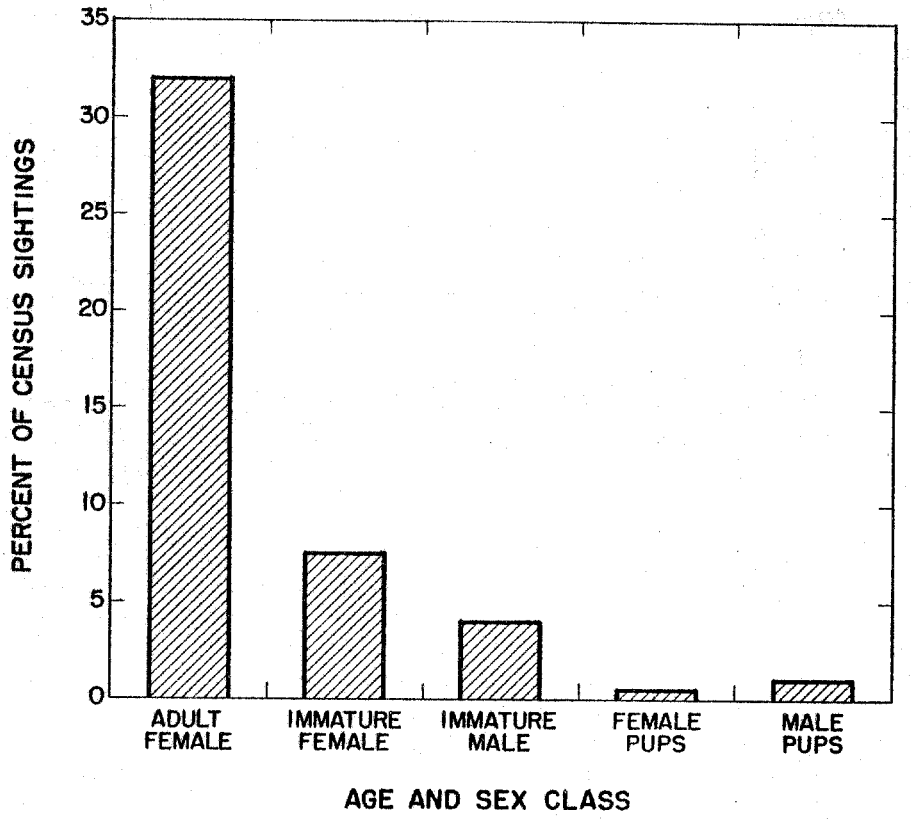

Figure 1.--Percent census sightings by age and sex class that individuals were observed within 1 m of an adult male monk seal, Lisianski Island 1982.

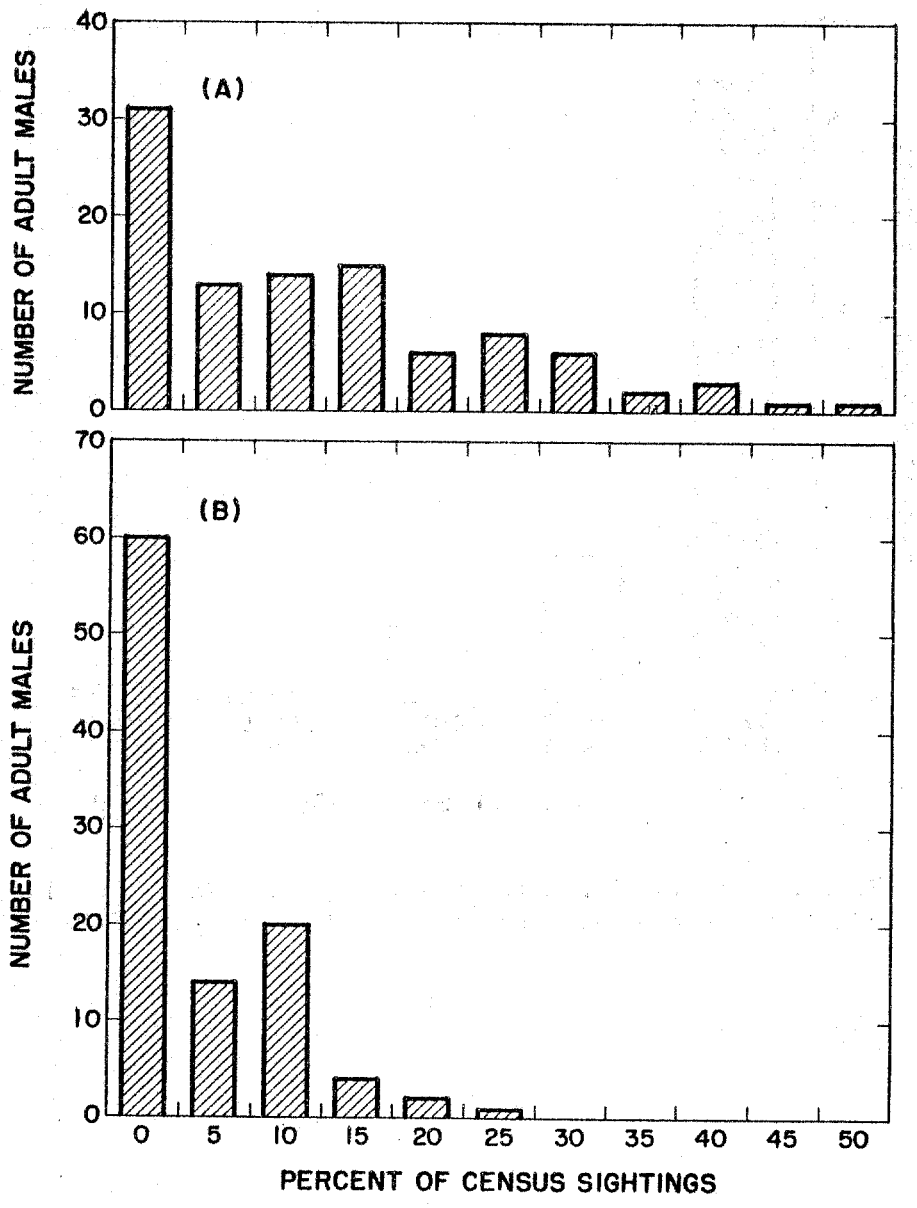

Figure 2.--Number of individual adult males by the percent of census sightings within 1 m of (A) an adult female monk seal and (B) an immature monk seal, Lisianski Island 1982.

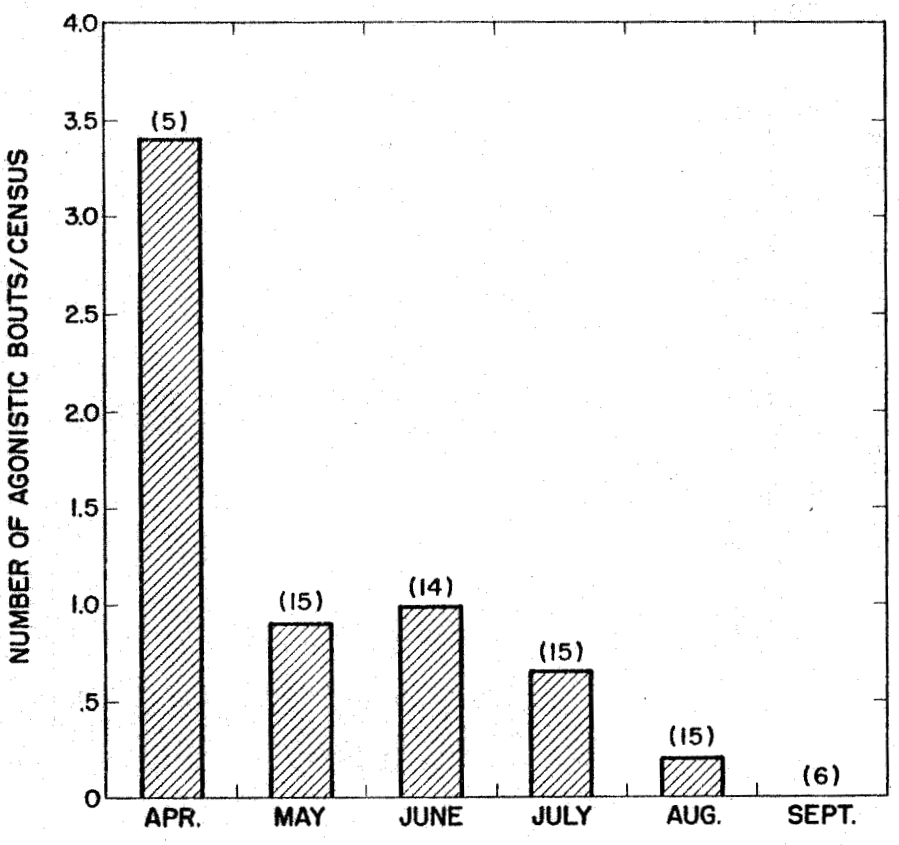

Figure 3.--Average number of adult male-male agonistic bouts observed per census by month, Lisianski Island 1982. Sample size is noted in parentheses.

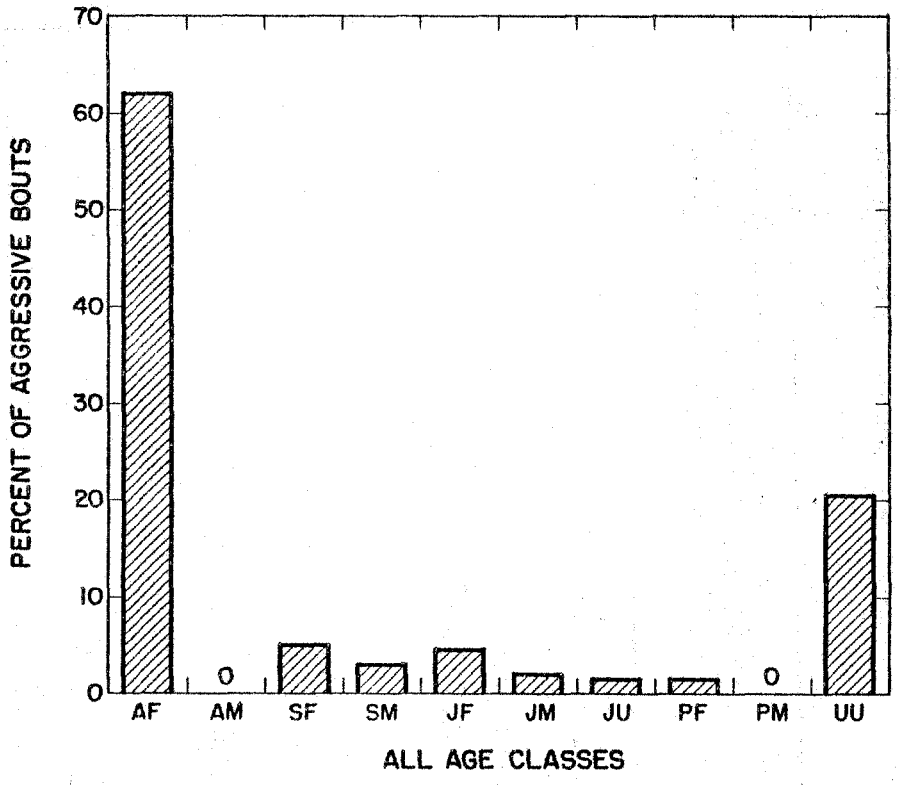

Figure 4.--Percent of all adult male-male agonistic bouts observed when the contestants were within 5 m of other individuals by the age and sex class of these other individuals, Lisianski Island 1982. AF = adult female, AM = adult male, SF = subadult female, SM = subadult male, JF = juvenile female, JM = juvenile male, JU = juvenile sex uknown, PF = weaned pup female, PM = weaned pup male, UU = no other individual within 5 m of the contestants.

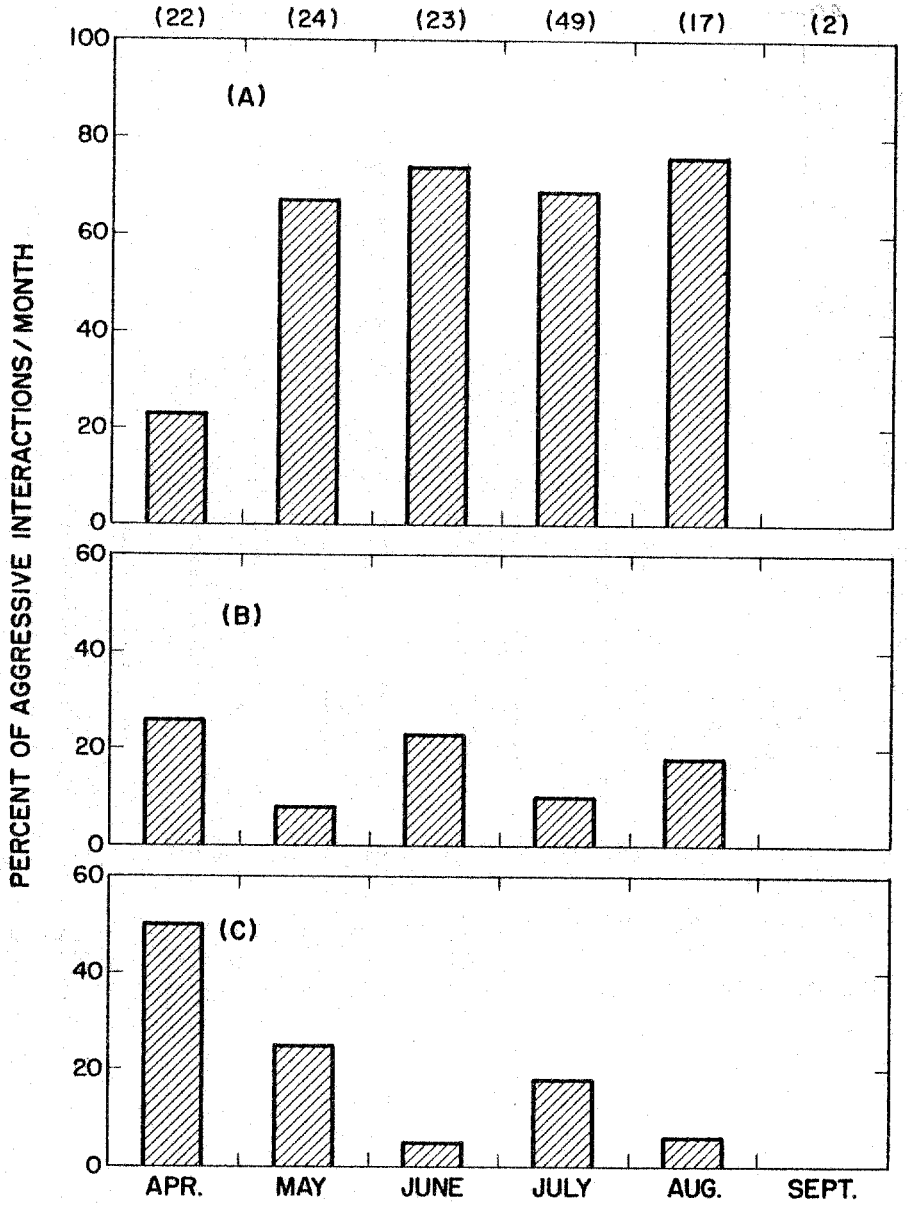

Figure 5.--Percent of all observed adult male-male agonistic bouts by month, when the contestants were within 5 m of (A) an adult female monk seal, (B) an immature monk seal, and (C) no other monk seal, Lisianski Island 1982. Sample size is noted in parentheses.

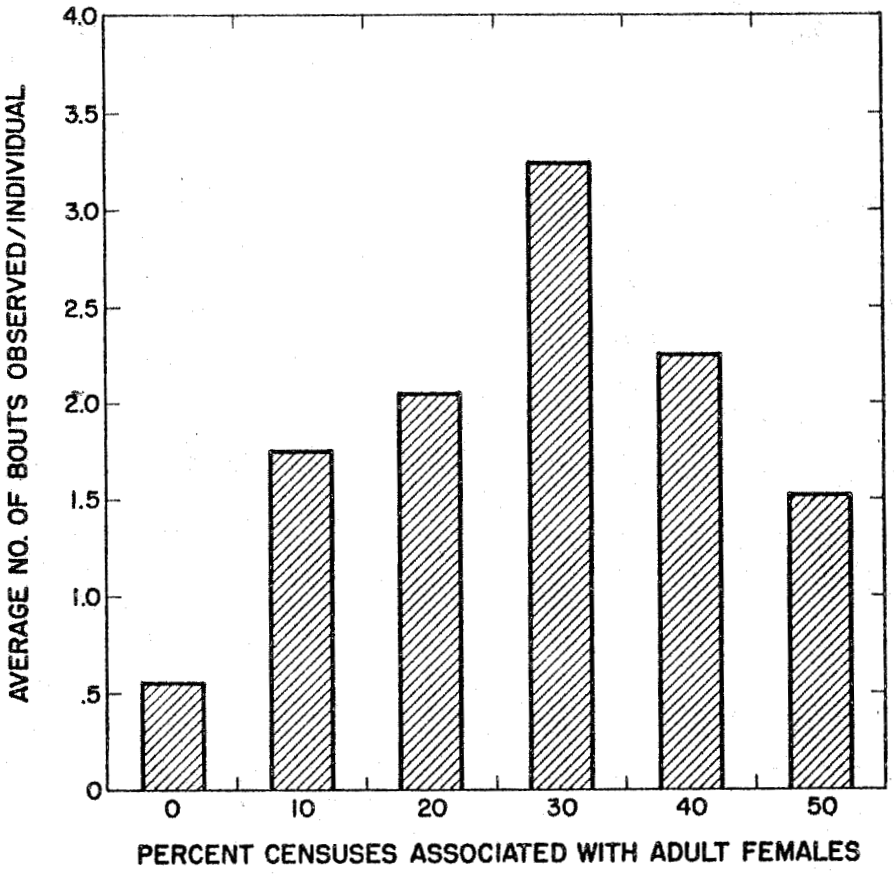

Figure 6.--Average number of agonistic bouts observed per individual adult male by average percent of census sightings these individuals were observed within 1 m of an adult female monk seal, Lisianski Island 1982.